

WHAT IS CLAIMED IS:

1. A control system for a cogeneration unit, the cogeneration unit including a heat engine and an alternator driven by the heat engine, the alternator generating AC electricity for an electrical load, the control system including:

a. parameter sensing means for sensing:

- 5 i. designated parameter(s) of the generated AC electricity; and
 ii. the temperature of a body heated by energy provided by the cogeneration unit;

 the parameter sensing means providing a sensed parameter value for each sensed parameter;

- 10 b. for each sensed parameter, a comparator means for comparing a sensed parameter value with a respective desired value, each comparator means being able to provide an error signal according to the difference between the sensed parameter value and the desired value; and

- c. each comparator means being coupled to a respective controlling means, each controlling means being capable of using the error signal from the comparator means to provide a control signal, such that each control signal can
15 used to regulate a respective parameter;

 wherein the regulation of the designated parameters is performed by controlling characteristics of the alternator, and the regulation of the temperature
20 of the body is performed by controlling fuel supply to the heat engine.

2. A control system for a cogeneration unit according to claim 1 wherein the electrical load includes a household load, the household load being connected to both the alternator and an external AC power source.

3. A control system for a cogeneration unit according to claim 2 wherein the designated parameter is a power factor of the generated AC electricity and the desired value is a desired power factor value.

5 4. A control system for a cogeneration unit according to claim 3 wherein the desired power factor value is able to be programmed into a programmable device of the control system.

10 5. A control system for a cogeneration unit according to claim 3 wherein the controlling means for the power factor parameter is a power factor controller, the power factor controller being capable of providing a power factor control signal to a field current controller, the field current controller being coupled to a field winding of the alternator, wherein in response to the power factor control signal the field current controller varies the field current.

15 6. A control system for a cogeneration unit according to claim 1 wherein the electrical load includes a household load and a dummy load, the household load and the dummy load both being connected to the alternator and not connected to an external AC power source.

20 7. A control system for a cogeneration unit according to claim 6 wherein the designated parameters are the output voltage and frequency of the generated AC electricity, and the desired values are a desired output voltage value and a desired frequency value.

25 8. A control system for a cogeneration unit according to claim 7 wherein the controlling means for the output voltage parameter is a voltage controller, the voltage controller being capable of providing a voltage control signal to a field current controller, the field current controller being coupled to a

field winding of the alternator, wherein in response to the voltage control signal the field current controller varies the field current of a field winding of the alternator.

5 9. A control system for a cogeneration unit according to claim 7 wherein the controlling means for the frequency parameter is a frequency controller, the frequency controller being capable of providing a frequency control signal to an electronic switch, such that the electronic switch varies the effective magnitude of the dummy load according to the frequency control signal, wherein
10 the variation of the effective magnitude of the dummy load is able to vary the speed of the alternator.

 10. A control system according to claim 9 wherein the electronic switch is a triac.

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 11. A control system for a cogeneration unit according to claim 6 wherein the dummy load is a resistive element, the resistive element being capable of heating the body.

20 12. A control system for a cogeneration unit according to claim 1 wherein the controlling means for the temperature parameter is a fuel controller, the fuel controller being capable of providing a fuel control signal to a fuel regulator, such that the fuel regulator varies the fuel supply rate to the heat engine according to the fuel control signal, wherein the variation of the fuel supply varies
25 the energy which is provided to the body.

 13. A control system for a cogeneration unit according to claim 12 wherein the body is a body of water which is able to be used in a hydronic heating system.

14. A control system for a cogeneration unit according to claim 13 wherein the desired temperature value is set using the hydronic heating system, wherein the hydronic heating system is capable of dissipating heat obtained from the body.

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15. A control system for a cogeneration system according to claim 13 wherein the control system further includes means for controlling the heat dissipation of the hydronic heating system.

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16. A control system for a cogeneration unit according to claim 1 wherein the control system further includes a switching means which is operable to select the electrical load type, the electrical load type being selected from:

a. a household load being connected to both the alternator and an external AC power source; and

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b. a household load and a controllable dummy load, both not being connected to an external power source.

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17. A method for controlling a cogeneration unit, the cogeneration unit including a heat engine and an alternator driven by the heat engine, the alternator generating AC electricity for an electrical load, the method including:

a. sensing parameters, the parameters including:

i. designated parameter(s) of the generated AC electricity; and

ii. the temperature of a body heated by energy provided by the cogeneration unit; such that the sensing provides a sensed parameter value for each sensed parameter;

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b. comparing a sensed parameter value with a respective desired value, the comparison providing an error signal according to the difference between the sensed parameter value and the desired value; and

c. using the error signal from the comparator means to provide a control signal, such that each control signal being can used to regulate a respective parameter;

wherein the regulation of the designated parameters is performed by controlling characteristics of the alternator, and the regulation of the temperature of the body is performed by controlling fuel supply to the heat engine.

18. A programmed computer for controlling a cogeneration unit, the cogeneration unit including a heat engine and an alternator driven by the heat engine, the alternator generating AC electricity for an electrical load, the programmed computer including software and hardware for:

a. sensing parameters, the parameters including:
i. designated parameter(s) of the generated AC electricity; and
ii. the temperature of a body heated by energy provided by the cogeneration unit;

such that the sensing provides a sensed parameter value for each sensed parameter;

b. comparing a sensed parameter value with a respective desired value, the comparison providing an error signal according to the difference between the sensed parameter value and the desired value; and

c. using each error signal to provide a respective control signal, such that each control signal can be used to regulate a respective parameter;

wherein the regulation of the designated parameters is performed by controlling characteristics of the alternator, and the regulation of the temperature of the body is performed by controlling fuel supply to the heat engine.

19. A programmed computer according to claim 16 wherein the desired values are programmable.

20. A multi-mode control system for a cogeneration unit, the cogeneration unit including a heat engine and an alternator driven by the heat engine, the alternator generating AC electricity for an electrical load, the control system including:

- 5 a. parameter sensing means for sensing:
- i. designated parameter(s) of the generated AC electricity; and
 - ii. the temperature of a body heated by energy provided by the cogeneration unit;

10 the parameter sensing means providing a sensed parameter value for each sensed parameter, the designated parameters being mode dependent such that in a first mode the designated parameters include the voltage and frequency of the AC electricity and in a second mode the designated parameters include the power factor of the AC electricity;

- 15 b. for each sensed parameter, a comparator means for comparing a sensed parameter value with a respective desired value, each comparator means being able to provide an error signal according to the difference between the sensed parameter value and the desired value; and

- 20 c. each comparator being coupled to a respective controlling means, each controlling means using the error signal from the comparator to provide a control signal, each control signal being used to regulate a respective parameter;

 wherein the regulation of the designated parameters is performed by controlling characteristics of the alternator, and the regulation of the temperature of the body is performed by controlling fuel supply to the heat engine and wherein the mode of the control system is selectable using a switch.

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21. A multi-mode control system for a cogeneration unit according to claim 20 wherein in the first mode the cogeneration unit operates independently of an external AC power source, and in the second mode the cogeneration unit operates in conjunction with an external AC power source.

22. A multi-mode control system for a cogeneration unit according to claim 21 wherein in the first mode the electrical load includes a dummy load and a household load.

5 23. A multi-mode control system for a cogeneration unit according to claim 22 wherein the effective magnitude of the dummy load is controlled by the controlling means associated with controller used to regulate the frequency parameter such that the control of the dummy load is able to be used to regulate the frequency of the AC electricity.

10 24. A multi-mode control system for a cogeneration unit according to claim 21 wherein in the second mode the electrical load includes a household load.

15 25. A control system for a cogeneration unit, the cogeneration unit including a heat engine and an alternator driven by the heat engine, the alternator generating AC electricity for an electrical load, the control system including:

20 a. parameter sensing means for sensing plural parameters, said plural parameters including designated parameters of the generated AC electricity, the parameter sensing means providing a sensed parameter value for each sensed parameter;

 b. for each sensed parameter, a comparator means for comparing the sensed parameter value with a respective desired value, each comparator means being able to provide an error signal according to the difference between the sensed parameter value and the desired value; and

25 c. one or more controlling means, the one or more controlling means being capable of using one or more of the error signals to provide a plurality of control signals, such that each control signal is able to regulate one or more of the sensed parameters;

wherein the regulation of the sensed parameters is performed by controlling characteristics of the alternator and a temperature of a body heated using energy from the cogeneration unit.

5 26. A control system for a cogeneration unit according to claim 25 wherein the control system is operable in at least a first and a second mode.

27. A control system according to claim 26 wherein in the first mode the cogeneration unit operates independently of an external AC power source.

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28. A control system according to claim 27 wherein the sensed parameters include the temperature of the body.

29. A control system according to claim 27 wherein the designated parameters of the generated AC electricity include:

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- a. frequency of the generated AC electricity; and
- b. voltage of the generated AC electricity.

30. A control system according to claim 27 wherein the electrical load includes a dummy load and a household load.

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31. A control system according to claim 30 wherein the effective magnitude of the dummy load is controlled by a control signal.

32. A control system according to claim 26 wherein in the second mode the cogeneration unit operates in conjunction with an external AC power course.

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33. A control system according to claim 32 wherein the sensed parameters include the temperature of the body.

34. A control system according to claim 32 wherein the designated parameters of the generated AC electricity includes the power factor of the generated AC electricity.

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35. A method for controlling a cogeneration unit, the cogeneration unit including a heat engine and an alternator driven by the heat engine, the alternator generating AC electricity for an electrical load, the control system including:

10 a. sensing plural parameters, said plural parameters including designated parameters of the generated AC electricity, the sensing providing a sensed parameter value for each sensed parameter;

b. comparing a sensed parameter value with a respective desired value;

15 c. providing an error signal according to the difference between the sensed parameter value and the desired value; and

d. using one or more of the error signals to provide at least one control signal, such that each control signal is able to regulate one or more of the sensed parameters;

20 wherein the regulation of the sensed parameters uses the control signals to control characteristics of the alternator and a temperature of a body heated using energy from the cogeneration unit.

36. A control system for a cogeneration unit, the cogeneration unit including a heat engine and an alternator driven by the heat engine, the alternator generating AC electricity for an electrical load, the control system including:

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a. Parameter sensing means for sensing:

i. At least one designated parameter of the generated AC electricity; and

the parameter sensing means providing a sensed parameter value for each sensed parameter;

b. for each sensed parameter, a comparator for comparing a sensed parameter value with a respective desired value and providing an error signal according to the difference between the sensed parameter value and the desired value; and

c. each comparator being coupled to a controller for using a respective error signal to provide a control signal for regulating a respective sensed parameter, such that at least one of the designated parameter control signals is provided to the alternator;

wherein the regulation of said at least one designated parameter is performed by controlling characteristics of the alternator and regulation of the temperature of the body is performed by controlling fuel supply to the heat engine.

37. A control system according to claim 1 wherein the control signal provided to the alternator includes an alternator field winding current control signal.

38. A control system according to claim 2 wherein the designated parameter regulated by the alternator field winding current control signal includes the voltage of the generated AC electricity.

39. A control system according to claim 2 wherein the designated parameter regulated by the field winding current control signal includes the power factor of the generated AC electricity.

40. A method for controlling a cogeneration unit, the cogeneration unit including a heat engine and an alternator driven by the heat engine, the alternator generating AC electricity for an electrical load, the method including:

a. sensing parameters, the sensed parameters including at least one designated parameters of the generated AC electricity and the temperature of a body heated by energy provided by the cogeneration unit such that the sensing provides a sensed parameter value for each sensed parameter;

5 b. comparing each sensed parameter value with a respective desired value;

c. providing an error signal for each sensed parameter according to the difference between the sensed parameter value and the desired value; and

10 d. using a respective error signal to provide a control signal for regulating a respective sensed parameter, such that at least one of the designated parameter control signals is provided to the alternator;

wherein the regulation of said at least one designated parameter is performed by controlling characteristics of the alternator and regulation of the temperature of the body is performed by controlling fuel supply to the heat engine.

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41. A control system according to claim 28 wherein the designated parameters of the generated AC electricity include:

- a. frequency of the generated AC electricity; and
- b. voltage of the generated AC electricity.

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42. A control system according to claim 33 wherein the designated parameters of the generated AC electricity includes the power factor of the generated AC electricity.